

906-41 Are Small Vessels Really More Calcified? A Comparison of Intravascular Ultrasound With Coronary Angiography

G.S. Mintz, K.M. Kent, A.D. Pichard, L.F. Satler, J.J. Popma, J. MacKenzie, C. Ewels, K. Morgan, J. DeVries, M.B. Leon. *Washington Hospital Center, Washington, DC, USA*

Lesions in small native coronary arteries are thought to contain more target lesion calcium (Ca). To test this, we studied 1111 *de novo*, non-ostial native vessel lesions. Coronary angiography was used to measure reference vessel size, minimum lumen diameter, and diameter stenosis (DS) and to assess target lesion Ca semi-quantitatively. Pre-intervention intravascular ultrasound (IVUS) was used to measure arcs of target lesion Ca and superficial Ca.

Reference vessel size (mm)

	<2.0 N = 51	2.1-2.5 N = 231	>2.5 N = 829	p
Angiography				
DS	65 ± 22	64 ± 20	63 ± 21	0.6217
None/mild (%)	50.9	54.5	60.8	
Moderate (%)	29.4	32.5	26.8	0.1132
Severe (%)	19.6	13.0	12.4	/
IVUS				
Arc of Ca	165 ± 124	115 ± 110	108 ± 109	0.0030
Arc of Ca > 180° (%)	42.2	26.8	23.1	0.0118
Arc of superficial Ca	154 ± 125	113 ± 111	104 ± 109	0.0090

Furthermore, there was no relationship between lumen compromise (measured by angiographic minimum lumen diameter or diameter stenosis) and IVUS lesion Ca. *We conclude:* Pre-intervention IVUS shows that target lesions in small vessels do indeed contain more calcium and superficial calcium. However, this increased calcification in small vessels is not observed during conventional angiography.

906-42 Safety of Intravascular Ultrasound in Cardiac Transplant Recipients

E.L. Mayer, A.C. De Franco, R.E. Hobbs, V. Guetta, M. Goormastic, J.B. Young, E.M. Tuzcu. *The Cleveland Clinic Foundation, Cleveland, OH, USA*

Background: Intravascular ultrasound (IVUS) is a sensitive method for assessment of allograft vasculopathy in cardiac transplant recipients, however, concerns have been raised regarding the safety of routine coronary instrumentation.

Methods: To evaluate the safety of IVUS in transplant recipients, we analyzed 1) immediate complications, 2) long-term adverse clinical events by comparing clinical outcomes during a pre-IVUS year (2/91-9/92) to a period in which IVUS was routinely used (2/93-9/94), 3) evidence of acceleration of atherosclerosis due to arterial instrumentation (by comparing disease in instrumented vs non-instrumented vessels).

Results: Between 2/93 and 4/96, we imaged 887 arteries during 408 examinations in 281 patients. 1) there were no dissections, thrombi, myocardial infarctions, emergency bypass surgery, death, or vascular complications requiring transfusion or surgical repair. Coronary spasm occurred in 4%, resolving promptly with nitroglycerin, 2) Comparing 176 patients from the pre-IVUS era to 266 patients in the IVUS era, there was no difference in mortality (6.0% vs 6.8%, $p = 0.28$) or incidence of myocardial infarction (1.9% vs 2.2%, $p = 0.45$), 3) A total of 29 arteries (13 LAD, 10 LCx, 6 RCA) were imaged in 19 patients within 4 weeks of transplantation, and again at 1 year. An additional 21 arteries (4 LAD, 7 LCx, 10 RCA) not previously imaged, and those imaged for the first time, demonstrated no difference in maximal (0.74 ± 0.46 mm vs 0.61 ± 0.5 mm, $p = 0.23$) or mean plaque thickness (0.43 ± 0.26 mm vs 0.38 ± 0.33 mm, $p = 0.18$).

Conclusion: Routine use of intravascular ultrasound in transplant recipients is not associated with serious immediate complications, increased mortality, myocardial infarction or acceleration of atherosclerosis in the imaged segments.

906-43 Intravascular Ultrasound Tissue Characterization Predicts Local Vasoreactivity in Early Coronary Atherosclerosis

A. Manginas, V. Voudris, G. Pavlides, G. Karatasakis, G. Athanassopoulos, V. Vassilikos, D.V. Cokkinos. *Onassis Cardiac Surgery Center, Athens, Greece*

Intravascular ultrasound (IVUS) is employed for evaluation of the morphology of early coronary atherosclerotic plaques. We studied 32 coronary segments with non-significant diameter stenosis, using quantitative angiography and IVUS. Local vasoreactivity was angiographically assessed after intracoronary

infusions of acetylcholine (Ach) 10^{-6} M and 10^{-5} M and Nitroglycerine (NTG) 0.2 mg. Following NTG, IVUS was used to evaluate the morphology and composition of the coronary plaques. The following IVUS parameters were obtained: maximal (MT) and minimal (mT) plaque + media thickness, vessel area (VA), lumen area (LA), plaque area (PA), minimal lumen diameter (MLD) and eccentricity index (EI). Planimetry of the fibrous elements within the plaque was used to categorize them as soft, mixed and fibrous, according to standard criteria.

MT was 1.09 ± 0.3 mm and mT 0.43 ± 0.2 mm. By IVUS, 12 plaques were soft, 16 mixed and 4 fibrous. During Ach, mean % diameter reduction was $6.9 \pm 12.6\%$ for Arch 10^{-6} M and $18.8 \pm 25.5\%$ for Ach 10^{-5} M. The degree of vasoconstriction to Ach correlated inversely to the MT ($p = 0.001$), the mT ($p = 0.004$) and PA ($p = 0.004$). Compared to soft plaques, atherosclerotic segments with mixed composition by IVUS exhibited significantly more vasoconstriction to Ach ($p = 0.008$) and vasodilation to NTG ($p = 0.01$).

Conclusion: In premature atherosclerotic plaques a) Ach induced vasoconstriction correlates inversely to the amount and thickness of the plaque-media as detected by IVUS and b) coronary plaques with mixed echogenic elements exhibit significantly greater vasoreactive responses to endothelium-dependent and independent stimuli compared to plaques with homogenous IVUS composition.

906-44 Evaluation of Coronary Vessel Wall Compliance by Intravascular Ultrasound: Importance of Plaque Distribution in Determining Regional Distensibility

M. Yamagishi, H. Tsutsui, T. Umeno, S. Nakatani, Y. Goto, K. Miyatake. *National Cardiovascular Center, Suita Osaka, Japan*

The previous studies showed that a coronary artery compliance is impaired in the presence of atherosclerosis. However, few data exist regarding the regional vessel wall distensibility. Therefore, the regional distensibility was determined by measuring luminal area and pressure using intravascular ultrasound (3.5 Fr, 30 MHz) in 45 left coronary sites from 40 patients. Luminal area in diastole (A) and in systole was measured at the diseased sites. With the ratio of luminal area changes (dA) to coronary pressure changes (dP) during a cardiac cycle, the total distensibility index was calculated by the formula: $\{(dA/dP) \times 10^3\}$. At the sites with non-circumferential disease, perimeters in diastole (L) and in systole were measured at the normal and diseased portions, and the changes in perimeters (dL) during a cardiac cycle were calculated. The regional distensibility index was obtained by the formula: $\{(dL/dP) \times 10^3\}$. In 22 sites with circumferential disease, the total distensibility index was 1.03 ± 0.61 mmHg, and significantly lower than that from 23 sites with non-circumferential disease that showed 1.45 ± 0.89 mmHg ($p < 0.05$). In non-circumferential disease, the regional distensibility index at diseased portion was significantly lower, 0.33 ± 0.47 mmHg, than that at normal portion, 1.11 ± 0.75 mmHg ($p < 0.01$). The coronary sites with residual non-circumferential disease after angioplasty also exhibited the heterogeneity of regional distensibility (0.73 ± 0.76 in disease vs 1.58 ± 0.95 mmHg in normal, $n = 10$, $p < 0.05$). These results indicate that the heterogeneous regional wall distensibility exists at the sites with non-circumferential disease where the total vessel distensibility is preserved by the presence of the compliant normal portion. This heterogeneity of the regional wall distensibility can be a biomechanical factor explaining the mechanism of plaque rupture that mainly occurs at the shoulder of the non-circumferential disease.

906-60 Gender and Hormonal Effects on Plaque Composition and Burden as Assessed by Intracoronary Ultrasound and 3-Dimensional Reconstruction

T. Caulin-Glaser, J.F. Setaro, K. Burger, M. Remetz, W. Farrell, S. Pfau, J. Brennan, H. Cabin, M. Cleman. *Yale School of Medicine, New Haven, CT, USA*

The incidence of cardiovascular disease is lower in women compared to men but increases after menopause. Estrogen (E_2) exerts an inhibitory effect on the development of CAD in women. The antiatherosclerotic effects of E_2 on lipid profile account for 30-50% of this benefit. Inhibition of plaque development can occur in response to E_2 in the absence of alterations in lipid levels. In this study we evaluate risk factors, lipid profile and E_2 levels of 40 patients referred for catheterization procedures. Pre-intervention coronary intravascular ultrasound (IVUS) with 3-D reconstruction was performed and read in a blinded fashion to assess plaque composition, % stenosis, and plaque burden.